

## CLAIMS

1. A power supply device for electric discharge machining comprising:

a switching circuit that supplies a discharge pulse current to an  
5 inter-electrode portion that is a portion between an electrode and a  
workpiece serving as another electrode arranged to be opposed to the  
electrode at a predetermined interval; and

a pulse-width control unit that generates a control pulse signal  
of a predetermined pulse width in response to a detection signal for  
10 starting a discharge at the inter-electrode portion, wherein

the switching circuit includes a switching circuit including a  
switching element suitable for a high-speed operation and a switching  
circuit including a switching element suitable for a low-speed operation,  
and receives the control pulse signal in parallel.

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2. The power supply device for electric discharge machining  
according to claim 1, wherein

the switching circuit includes

a first switching circuit that receives a detection signal  
20 for discharge start in the inter-electrode portion; and

a second switching circuit that receives a control pulse  
signal of a predetermined pulse width generated in response to the  
discharge start,

the first switching circuit includes either of the switching  
25 element suitable for the high-speed operation and the switching

element suitable for the low-speed operation, and

the second switching circuit includes the switching element suitable for the low-speed operation.

- 5     3.     The power supply device for electric discharge machining according to claim 2, wherein when the first switching circuit includes the switching element suitable for the high-speed operation, the detection signal for starting the discharge is directly applied to a control terminal of the switching element suitable for the high-speed operation.

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4.     The power supply device for electric discharge machining according to claim 2, wherein the first switching circuit includes a plurality of drive circuits that receives the detection signal for starting the discharge, and generates a drive pulse signal of a different pulse width; and

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a selection circuit that selects a drive pulse signal from any one of the drive circuits, and applies the drive pulse signal selected to a control terminal of the switching element based on an instruction from outside.

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5.     The power supply device for electric discharge machining according to claim 1, wherein

the switching circuit includes

a first switching circuit that receives the detection signal

- 25     for starting the discharge; and

a second switching circuit that receives the control pulse signal,

the first switching circuit includes the switching element suitable for the high-speed operation,

5 the second switching circuit includes the switching element suitable for the low-speed operation, and

the pulse-width control unit controls a pulse width of the control pulse signal to be different between the switching elements opposed to each other in the second switching circuit.

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6. The power supply device for electric discharge machining according to claim 5, wherein the pulse-width control unit includes

a first setting unit that generates the control pulse signal that is set to a first pulse width giving a period in which one of the opposed  
15 switching elements comes into a conductive state, and gives the control pulse signal to a drive unit of the one of the opposed switching elements; and

a second setting unit that generates the control pulse signal that is set to a second pulse width giving a period in which other of the  
20 opposed switching elements comes into a conductive state, and gives the control pulse signal to a drive unit of the other of the opposed switching elements.

7. The power supply device for electric discharge machining according to claim 5, wherein the pulse-width control unit includes

a setting unit that generates the control pulse signal that is set to a first pulse width;

5 an extension unit that extends the first pulse width to produce a second pulse width, and outputs the control pulse signal of the second pulse width; and

a switching unit that switches the control pulse signal having the first pulse width and the control pulse signal having the second pulse  
10 width, and outputs the control signal to a drive unit, which drives the opposed switching elements according to an instruction from outside as a control pulse signal having a pulse width that brings the respective switching elements into a conductive state.

15 8. The power supply device for electric discharge machining according to claim 5, wherein

the pulse-width control unit includes

a first setting unit that generates the control pulse signal that is set to a first pulse width giving a period in which one of the  
20 opposed switching elements comes into a conductive state, and gives the control pulse signal to a drive unit of the one of the opposed switching elements;

a second setting unit that generates the control pulse signal that is set to a second pulse width giving a period in which other  
25 of the opposed switching elements comes into a conductive state, and

gives the control pulse signal to a drive unit of the other of the opposed switching elements; and

a third setting unit that sets a pulse width giving a period in which the respective switching elements opposed to each other in the first switching circuit are brought into a conductive state, and

the drive unit that drives the respective switching elements opposed to each other in the first switching circuit receives the detection signal for starting the discharge, and generates a drive pulse signal having the pulse width set by the third setting unit to drive the respective switching elements.

9. The power supply device for electric discharge machining according to claim 5, wherein

the pulse-width control unit includes

a first setting unit that generates the control pulse signal that is set to a first pulse width;

an extension unit that extends the first pulse width to produce a second pulse width, and outputs the control pulse signal of the second pulse width;

a switching unit that switches the control pulse signal having the first pulse width and the control pulse signal having the second pulse width, and outputs the control signal to a drive unit, which drives the opposed switching elements according to an instruction from outside as a control pulse signal having a pulse width that brings the respective switching elements into a conductive state; and

a second setting unit that sets a pulse width giving a period in which the respective switching elements opposed to each other in the first switching circuit are brought into a conductive state, and

5        the drive units that drives the respective switching elements opposed to each other in the first switching circuit receives the detection signal for starting the discharge, and generate a drive pulse signal having the pulse width set by the second setting unit to drive the respective switching elements.

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10.     The power supply device for electric discharge machining according to claim 1, further comprising a pulse-width setting unit that performs setting for changing a pulse width of the control pulse signal before starting the discharge from outside.

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11.     A power supply device for electric discharge machining comprising:

         a first pulse-width control unit and a second pulse-width control unit that generate a control pulse signal of a first pulse width and a  
20    control pulse signal of a second pulse width, respectively, in response to starting of a discharge in an inter-electrode portion that is a portion between an electrode and a workpiece serving as another electrode arranged to be opposed to the electrode at a predetermined interval;

         a first switching circuit that receives the control pulse signal of  
25    the first pulse width and supplies a discharge pulse current to the

inter-electrode portion, the first switching circuit including a first switching circuit that includes a switching element suitable for a low-speed operation;

5 a second switching circuit that receives the control pulse signal of the second pulse width and supplies a discharge pulse current to the inter-electrode portion, the switching circuit including a second switching circuit that includes a switching element suitable for a high-speed operation;

10 a discharge-state judging unit that judges a discharge state at a time of starting the discharge in the inter-electrode portion from among a normal discharge state, an immediate discharge state, and a short circuit state; and

15 a current-pulse selecting unit that issues an output instruction to the first pulse-width control unit when the discharge-state judging unit judges that the discharge state is the normal discharge state, and issues an output instruction to the second pulse-width control unit when the discharge-state judging unit judges that the discharge state is either of the immediate discharge state and the short circuit state.

20 12. The power supply device for electric discharge machining according to claim 11, further comprising a pulse-width setting unit that performs setting for changing a pulse width of the control pulse signal before starting the discharge from outside.

13. A power supply device for electric discharge machining comprising:

a first pulse-width control unit and a second pulse-width control unit that generate a control pulse signal of a first pulse width and a control pulse signal of a second pulse width, respectively, in response to starting of a discharge in an inter-electrode portion that is a portion between an electrode and a workpiece serving as another electrode arranged to be opposed to the electrode at a predetermined interval;

a first switching circuit that receives the control pulse signal of the first pulse width and supplies a discharge pulse current to the inter-electrode portion, the first switching circuit including a first switching circuit that includes a switching element suitable for a low-speed operation;

a second switching circuit that receives the control pulse signal of the second pulse width and supplies a discharge pulse current to the inter-electrode portion, the switching circuit including a second switching circuit that includes a switching element suitable for a high-speed operation;

a discharge-state judging unit that judges a discharge state at a time of starting the discharge in the inter-electrode portion from among a normal discharge state, an immediate discharge state, and a short circuit state; and

a current-pulse stop unit that issues an output stop instruction to the first pulse-width control unit when the discharge-state judging unit judges that the discharge state is either of the immediate discharge



state and the short circuit state.

14. The power supply device for electric discharge machining according to claim 13, further comprising a pulse-width setting unit that
- 5 performs setting for changing a pulse width of the control pulse signal before starting the discharge from outside.